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ABSTRACT

A follow-up study of 135 4-to-12-year-old boys, all of whom displayed symptomatology associated with the hyperkinetic minimal brain dysfunction syndrome, was undertaken in an attempt to specify those factors which predict delinquent behavior. The follow-up interviews queried norm-violating and delinquent behaviors. The Ss' answers were compared with normative data for delinquent activity and it appeared that hyperactive Ss as a group were not more involved in such activities than other adolescents. Results indicated that the scores on the child aggression factor at referral were predictive of all but drinking offenses, whereas scores on the child hyperactivity factor failed to predict any of the four categories (offenses against persons, offenses against property, involvement with illegal drugs, and drinking offenses) of delinquent behavior at follow-up. (Author/PHR)

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PREDICTING ADOLESCENT ANTISOCIAL BEHAVIOR AMONG HYPERACTIVE BOYS

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Introduction

In recent years, increasing attention has been devoted to a possible link between childhood hyperactivity and juvenile delinquency. Although numerous authors postulate a positive relationship between the two, the issue is far from resolved. Several problems at present stand in the way of a definitive answer.

One major difficulty is that definitions of hyperactivity vary to a considerable extent from study to study. A particularly acute problem is the inconsistent treatment given aggressive behavior from one definition to another. Some studies allow but do not require aggression (e.g. Mendelson, Johnson & Stewart, 1971), and others do not appear to address the issue (e.g. Ackerman, Dykman & Peters, 1977). Research has pointed to the importance of child aggression as a predictor of later antisocial activity (e.g. Robins, 1966), and it is therefore imperative to separate aggression from hyperactivity and examine their independent contributions to the prediction of delinquency. Until aggression is taken systematically into account, a relationship between hyperactivity per se and delinquency cannot be assumed.

The Follow-Up Study

The study to be presented is a preliminary analysis of data collected from hyperactive subjects at two points in time. Our data come from a comprehensive study of 135 nonretarded four- to twelve-year-old boys, all of whom displayed symptomatology associated with the Hyperkinetic/Minimal Brain Dysfunction (HK/MBD) Syndrome and all of whom began a trial of CNS stimulants at the University of Iowa Child Psychiatry Outpatient Service between January 1, 1967, and September 1, 1972. Numerous scores and ratings have been systematically accumulated from the boys' psychiatric charts and placed in a computer archive, thereby giving us a wide-ranging multivariate data resource describing the boys and their families at the time of psychiatric referral and detailing the boys' initial clinical response to stimulant drug treatment.

We also carried out a long-term follow-up study of the 135 boys whose records were employed for the referral study. At the time of follow-up, an average of five years had elapsed since the initial outpatient evaluation. As part of these efforts, we repeated most of the original home and school intake forms; obtained a variety of behavioral ratings and questionnaires from parents, teachers, and the boys themselves; conducted parallel forms of a structured interview with each boy and each of the parents; and administered an extensive battery of cognitive, personality, and achievement tests. Ninety-two percent of our referral sample (124 boys and their parents) were seen at follow-up, 79% of them between the ages of 12 and 18.

Delinquent Involvement at Follow-Up

Included in the follow-up interview were a series of questions which tapped norm-violating and delinquent behavior. For purposes of the delinquency analyses, responses to these questions were classified into several *apriori* categories, among them: offenses against persons, offenses against property, involvement with illegal drugs, and drinking offenses. Within each category, frequency was coded along a four-point scale ranging from no involvement to chronic or continuing involvement. Disagreements between interview informants (mother, father, child) were resolved by choosing the response implying the greatest degree of delinquent behavior. If, for example, the mother and father of a subject reported no marijuana use by their son and the son reported the occasional use of it, that subject was coded as using marijuana occasionally.

In addition to tabulating our data in this fashion, preliminary comparisons were made with normative delinquency data from the Midwest. These data were gathered from students through questionnaires and interviews in similar fashion to our own and measure what is known as "hidden" or unofficial delinquency (Gold, 1966).

Twenty-one percent of our subjects reported engaging in illegal acts against persons. The behaviors in this category included primarily fighting. By way of comparison, fifty percent of an Illinois sample of 14-to-18 year olds (Rivera, Rafferty & Krouse, 1972) admitted to fighting.

Twenty-nine percent of our sample said that they had committed acts against property. Typical behaviors in this category were vandalism, shoplifting, theft, and breaking and entering. In contrast, 56 percent of the subjects in the Rivera et al. (1972) study said they had committed minor thefts (less than $20 in value), and 13 percent admitted to more serious property offenses (e.g., breaking and entering).

Nineteen percent of our hyperactive subjects responded affirmatively to questions about drug offenses. This category included using, giving, or selling illegal substances such as marijuana, amphetamines, and hallucinogens. Two recent Iowa drug surveys suggest that this level of involvement is at or below expected norms for the state. In one study (Hays, 1976), 21 percent of 6th, 8th, 10th, and 12th graders admitted using marijuana at least once and 11 percent admitted trying other drugs. The other investigator (Chambers, 1976) queried 14-to-17 year olds and found between 23 and 35 percent of the subjects claimed to use marijuana and between 4 and 13 percent said they had tried hallucinogens, heroin, and cocaine.

With respect to drinking offenses, 28 percent of our sample stated they used alcohol underage (without parental consent) or had given or sold it to a minor. By comparison, between thirty and 36 percent of Iowa 14-to-17 year olds at large (Chambers, 1976) said they used alcohol at least once a week.

While these rough comparisons suffer from the fact that different questions were asked of the two populations, they do suggest that teen-age boys originally referred for overactivity and inattention may not exhibit "hidden" delinquent behaviors to a greater extent than the adolescent population at large. We are presently re-interviewing our sample at age 21. This second follow-up includes a

greatly expanded set of questions on antisocial activities ranging from simple littering through rape and murder. These questions will be administered not only to our subjects, but to their brothers as they turn 21 as well. This will furnish a comparison group equated for age, locale, and home environment, and we hope thereby to more precisely assess our subject's antisocial activities relative to others.

Prediction from Referral Data of Delinquent Behavior at Follow-Up

Within the present data one might ask what variables at referral predict antisocial behaviors at adolescent follow-up. In order to determine this, a number of referral measures were selected as potential predictors of later delinquent activity (Table 1). These variables were chosen to sample the areas of social background (e.g. SES), family background (e.g. maternal love-to-hostility ratings), academic achievement (e.g., teachers' rating of school performance), symptomatology (e.g. aggression and hyperactivity factor scores), and treatment (e.g. response to methylphenidate factor score). The aggression and hyperactivity factor scores were the products of a principal-axis factor analysis of referral symptoms contained in the children's medical charts and rated by our research staff. The treatment response factor score resulted from a similar analysis of several blind ratings of the clinical progress notes.

Four stepwise multiple regression analyses were then carried out in an attempt to predict each of the four categories of delinquent behavior at follow-up. The stepwise regression proceeded by identifying the single predictor variable which had the largest correlation with the criterion behaviors. Remaining variables which contributed independently to prediction were then added in order of their maximal increments to the multiple correlation until the inclusion of a variable failed to generate a significant increment ($p < .05$).

Offenses against persons at follow-up (Table 2) were predicted by degree of paternal control, scores on the aggression factor, and the overall neurological signs rating. These three referral variables together accounted for 36% of the variance at follow-up. Greater paternal control, more child aggression, and fewer neurological signs predicted more offenses against persons.

Offenses against property were predicted by rural or urban residence, number of children in the family, and scores on the aggression factor (Table 3). Forty-one percent of the variance was accounted for by these three variables, with urban residence, more children, and more child aggression predicting greater subsequent involvement with property offenses.

Drinking offenses were predicted only by age at referral, probably reflecting the trivial fact that older subjects were more likely to have access to alcohol at follow-up. Drug offenses (Table 4) were predicted by scores on the aggression factor, age at referral, rural or urban residence, and response to methylphenidate. Taken together, 44% of the variance in adolescent drug offenses was predicted by these referral variables. The direction of the correlations was such that less child aggression and younger age at referral, rural residence, and better response to methylphenidate predicted fewer drug offenses at follow-up.

Several facets of the above findings bear discussion. First, the N was 30, which is small relative to the overall sample of 124. It was decided to adopt a statistically conservative approach by eliminating subjects from the regression analyses if they lacked data on any of the variables chosen as potential predictors. Although our regressions were based on a residual subsample of 30 subjects with complete data, corrections for shrinkage indicated that all multiple correlations would remain significant ($p < .05$).

Second, the finding that better initial response to methylphenidate predicts fewer drug offenses in adolescence needs to be interpreted narrowly. The subjects

in our sample were all treated with cerebral stimulants; therefore, we are looking at degree of response within a drug-treated sample. We are not comparing drug-treated versus untreated subjects, and one cannot necessarily extrapolate findings from one situation to the other. And, clearly, the modest size of the correlation between response to medication and subsequent drug offenses, and the small N on which it is based, dictate the need for replication by others. We are presently in the process of following up an additional sample of subjects who at referral presented similar problems with overactivity and inattention but were not given cerebral stimulants. This second sample will ultimately provide us with an unmedicated control group.

Finally, and perhaps most importantly, we found that scores on the child aggression factor at referral were predictive of all but drinking offenses, whereas scores on the child hyperactivity factor failed to predict any of the four categories of delinquent behavior at follow-up. This suggests that hyperactivity, when separated from aggressive behavior, bears little if any relationship to subsequent delinquency.

Thus, these data challenge the standing assumption of a link between hyperactivity and later delinquency. Conversely, we have shown a connection between childhood aggression and later delinquency within a hyperactive sample. The preliminary analyses presented here underscore the need for additional investigations which separate and systematically explore hyperactivity, aggression, and other behaviors as predictors of subsequent antisocial behaviors.

TABLE 1

SOCIAL BACKGROUND VARIABLES

1. Socioeconomic Status (SES).
2. Rural or urban residence.
3. Perinatal complications rating.

FAMILY VARIABLES

1. Did biological triad end?
2. How long was biological triad intact?
3. Number of changes between end of biological triad and beginning of current situation.
4. Maternal love-to-hostility rating.
5. Paternal love-to-hostility rating.
6. Maternal autonomy-to-control rating.
7. Paternal autonomy-to-control rating.
8. Number of children in family.

CHILD SYMPTOM VARIABLES

1. Aggression factor score.
2. Hyperactivity factor score.
3. Neurological signs rating.

CHILD ACADEMIC VARIABLES

1. Past academic performance rating.
2. Reading rating.
3. Arithmetic rating.

TREATMENT VARIABLES

1. Age at referral.
2. Response to CNS stimulant treatment (methylphenidate).
3. Length of CNS stimulant treatment.

TABLE 2

CRITERION: OFFENSES AGAINST PERSONS AT FOLLOW-UP

STEP ENTERED	PREDICTOR	SIMPLE CORRELATION	MULTIPLE CORRELATION	MULTIPLE R^2
1.	PATERNAL CONTROL	.36	.36	.13
2.	AGGRESSION FACTOR SCORE	.20	.54	.29
3.	NEUROLOGICAL SIGNS RATING	-.33	.60	.36

TABLE 3

CRITERION: OFFENSES AGAINST PROPERTY AT FOLLOW-UP

STEP ENTERED	PREDICTOR	SIMPLE CORRELATION	MULTIPLE CORRELATION	MULTIPLE R^2
1.	RURAL/URBAN RESIDENCE	.43	.43	.18
2.	NUMBER OF CHILDREN IN FAMILY	.31	.55	.30
3.	AGGRESSION FACTOR SCORE	.38	.64	.41

TABLE 4

CRITERION: INVOLVEMENT WITH ILLEGAL DRUGS AT FOLLOW-UP

STEP ENTERED	PREDICTOR	SIMPLE CORRELATION	MULTIPLE CORRELATION	MULTIPLE R^2
1.	AGGRESSION FACTOR SCORE	.37	.37	.14
2.	AGE AT REFERRAL	.35	.50	.25
3.	RURAL/URBAN RESIDENCE	.34	.57	.32
4.	RESPONSE TO METHYLPHENIDATE	-.16	.66	.44

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